

REMARKS

Claims 1-14 and 16-40 are pending in the Application, of which claims 1 and 2 are in independent form. Claims 3-5, 19-20, 22-23, 34-35, and 37-38 are amended herein. Claims 6 and 7 were previously withdrawn from consideration. For the Examiner's convenience, each of the issues raised in the Office Action mailed March 17, 2008 (the Office Action) are addressed in the order they were raised in the Office Action.

Applicants believes the application is in condition for allowance and respectfully request the same.

I. Objection to Claims 3-5

The Office Action objects to claims 3-5 under 35 U.S.C. § 112 ¶ 1 as purportedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. *See* Office Action ¶ 11. Specifically, the Office Action states that claim 2 (from which claims 3-5 depend) defines that, "for each electronic heartbeat signal" acquired, "a plurality of pre-selected heartbeat waveform features" are measured, whereas claims 3-5 recited a "variable." *Id.* As such, the Office Action purports that the meaning of "variable" as recited in claims 3-5 is unclear.

To address the objection, Applicants have amended claims 2-5. Claim 2 as amended herein recites, "...for each electronic heartbeat signal, measuring one or more pre-selected heartbeat waveform features to generate corresponding measurements...." Claim 3 recites, "wherein said measurements are made on only one heartbeat waveform feature per acquisition." Claims 4 and 5 have been similarly amended. With this amendment, and since claims 2-5 now use similar language, Applicants believe that no there is no ambiguity in the meaning of claims 2-5. Accordingly, Applicants respectfully traverse the objection to claims 3-5.

II. Claim Amendments

Claim 19 and 34 have been amended herein to recite, "...wherein a pre-selected heartbeat waveform feature is a difference between two peak pressure changes." Emphasis added. Claims 20 and 35 have been amended herein to recite, "...wherein a pre-selected heartbeat waveform feature is a difference between two peak rate of pressure changes." Emphasis added. Claims 22 and 37 have been amended herein to recite, "...wherein a pre-selected heartbeat waveform

feature is an up slope of a maximum peak pressure.” Emphasis added. Claims 23 and 38 have been amended herein to recite, “...wherein a pre-selected heartbeat waveform feature is a down slope of a maximum peak pressure.” Emphasis added.

The specification as filed supports these claim amendments. For example, the specification describes a pressure heartbeat waveform (*e.g.*, a heartbeat waveform including a dicrotic notch feature):

“All of the heartbeat waveforms share a number of standard features that can be used as reference points for other measurements. For example, all heartbeat waveforms can be divided into two distinct peaks. As part of the individualization process, the heartbeat waveform can be analyzed relative to the two peaks. Various parameters associated with waveform peaks include, but are not limited to, the differences between the two peak amplitudes, the differences between the two peak rate of changes, the relative position of the dicrotic notch, how deep the notch is, how far the dicrotic notch is from a zero point—a reference point, and how far it is from the center of one of the peaks, where the peak of the dicrotic notch is located along the horizontal, and the position of the various peaks from the center of the waveform and from the center of the other peak. Often several features can be extracted out of the waveform to serve in the individualization process.” [0043].

As taught in the application (*see* ¶ [0069] below), a dicrotic notch is a feature of a pressure heartbeat waveform (*e.g.*, a hemodynamic waveform). Accordingly, the “peak amplitudes” and “peak rate of changes” disclosed above may refer to peak pressure amplitudes and peak rate of pressure changes. The specification discloses the use of characteristics of a pressure waveform (*e.g.*, hemodynamic waveform) for use as biometric markers:

“Other biometric markers obtained may come from a changing pressure within the artery or arteries being monitored and can be described and analyzed as a hemodynamic waveform. The arterial pressure fluctuates as a result of the cardiac cycle. As the heart's atrium ventricles contract and relax (undergo systole and diastole), pressure in the arterial blood vessels correspondingly rises and falls in a wave-like manner. This pressure waveform or a waveform of an electrical signal received from the user's body has distinct characteristics. For example, for the hemodynamic waveform the characteristics result from the timing of systole and diastole and the opening and closing of the cardiac valves. The waveform of one preferred embodiment may be a composite waveform reflecting events in the cardiac cycle, for example: peak systolic pressure, the dicrotic notch, diastolic pressure, the anacrotic notch, and potentially pulse pressure.” [0069].

III. Claim Rejections under 35 U.S.C. § 102

The Office Action rejects claims 1-3, 16, 17, and 30-32 under 35 U.S.C. § 102 (b) as allegedly being anticipated by Biel et al. “ECG Analysis: A New Approach to Human

Identification” (hereafter “Biel”).

A claim may be rejected under § 102(b), “only if each and every element as set forth in the claim is found, either expressly or inherently, in a single prior art reference.” Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628 (Fed. Cir. 1987); emphasis added; *also see* MPEP § 2131. The “identical invention must be shown in as complete detail as is contained in the ... claim.” Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236 (Fed. Cir. 1989); *also see* MPEP 2131. Since Biel does not teach or suggest all of the features of the rejected claims, Applicants respectfully traverse this rejection.

A. Biel does not Teach or Suggest Weighting ... Pre-Selected Heartbeat Waveform Features to Provide a Different Statistical Weight for Each Pre-Selected Heartbeat Waveform Feature

The Office Action purports that Biel teaches features that are “statistically weighted for variance” since “Biel specifies that all of the features are correlated with one another with a relative high correlation with other features removed.” Office Action ¶ 14. Biel provides no such teaching.

Biel discusses using a covariance matrix (*e.g.*, correlation between measurements) to build a “Principal Component Analysis (PCA) model for each class.” Biel Pg. 559. Biel states that PCA is “a classical statistical method based on eigenvalues and eigenvectors. The eigenvectors will be created and form a new orthogonal basis. The eigenvector with the largest value will have the direction of the largest variance of the data, and therefore the most information will be found in that direction. PCA is also a method for data reduction.” *Id.* Notwithstanding Biel’s discussion of PCA analysis to determine “Principal Components” within a measurement dataset, this is not what is claimed.

The claims do not recite identifying measurements having “the largest variance of the data” generally. In contrast to Biel, the claims do not merely recite identifying features having high variance, but rather recite: “...weighting the pre-selected heartbeat waveform features to provide a different statistical weight for each pre-selected heartbeat waveform feature...” Claim 1. Claim 2 recites related features. “Identifying” features having high variance cannot be construed as weighing a features to provide a “different statistical weight” to each feature as recited in the claims.

B. *Biel does not Teach or Suggest Authenticating an Individual*

The Office Action purports that Biel “expressly discloses that a user may be authenticated using the weighted pre-selected heartbeat waveform features.” However, Biel provides no such teaching or suggestion. As discussed above, Biel provides no teaching or suggestion to “weigh” pre-selected heartbeat waveform features. Moreover, Biel does not teach authenticating an individual as recited in the claims. In fact, Biel states that the “authentication” purportedly discussed therein is based on membership within a group, “[t]his approach ... is shown to make it possible to identify persons from a predetermined group, i.e. a team of operators in a industry.” Biel Pg. 560. Moreover, Biel states that it uses a Soft Independent Modeling of Class Analogy (SIMCA) method for classification. Biel states that SIMCA is used to, “find similarities between [a] test object and classes rather than find identical behavior.” Biel at 559; emphasis added. SIMCA is a statistical method for supervised classification of data; the term soft refers to the fact the classifier can identify samples as belonging to multiple classes and not necessarily producing a classification of samples into non-overlapping classes. See http://en.wikipedia.org/wiki/Soft_independent_modelling_of_class_analogies.

By contrast, the claims recite, “authenticating an individual based on the weighted pre-selected heartbeat waveform features.” Claim 1; emphasis added. Claim 2 recites related features. “Identifying persons form a predetermined group” discussed in Biel cannot be construed as authenticating an identity of an individual as recited in the claims. Moreover, the soft modeling method (SIMCA) used in Biel to make the classification teaches away from individual authentication; the SIMCA may identify samples as belonging to “multiple classes.”

Since Biel fails to teach or suggest at least: weighing pre-selected heartbeat waveform features to provide a different statistical weight for each; and/or authenticating an individual based on the weighted pre-selected heartbeat waveform features, Applicants respectfully traverse the rejection of claims 1-3, 16, 17, and 30-32.

IV. Claim Rejections under 35 U.S.C. § 103

The Office Action rejects claims 18-23 and 33-38 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Biel. Specifically, the Office Action purports that although Biel does not disclose the recited waveform features, “it would have been obvious matter of design choice to a person of ordinary skill in the art for the pre-selected ECG waveform features to comprise

the claimed features because Applicant has not disclosed that any one feature provides an advantage, is used for a particular purpose, or solves a stated problem.” Office Action ¶ 18.

To support a *prima facie* case of obviousness, the Office Action must offer a “clear articulation of the reason(s) why the claimed invention would have been obvious.” KSR Intl. Co. v. Teleflex Inc., 127 S. Ct. 1727 (2007); *also see* MPEP § 2143. The analysis supporting the rejection should be made explicit. *See* MPEP § 2143. Any rejection under § 103 must consider all the words in the claim. *See In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970); *also see* MPEP § 2143.03. Therefore, the cited prior art must teach or suggest all the claim limitations. *See In Re Royka* 490 F.2d 981 (CCPA 1974).

As discussed above, Biel fails to teach or suggest at least: weighing pre-selected heartbeat waveform features to provide a different statistical weight for each; and/or authenticating an individual based on the weighted pre-selected heartbeat waveform features. However, in addition, Biel cannot teach or suggest the heartbeat waveform features recited in claims 18-23 and 33-38.

Biel discusses the use of waveform generated using a “standard 12-lead electrocardiogram (ECG).” Biel abstract. The ECG is used to “measure and record different electrical potentials of the heart.” Biel Pg. 557. An ECG device would be incapable of measuring the recited heartbeat waveform features.

Claim 18 recites, “... wherein a pre-selected heartbeat waveform feature is a position of a dicrotic notch.” Emphasis added. Claim 33 recites a similar feature. A dicrotic notch is, “a secondary upstroke in the descending part of a pulse tracing corresponding to the transient increase in aortic pressure upon closure of the aortic valve -- called also *dicrotic wave*.” *See* Merriam-Webster’s Online Dictionary, <http://medical.merriam-webster.com/medical/dicrotic%20notch> (last accessed March 31, 2008); emphasis added. A ECG capable of measuring electrical potentials would be incapable of measuring this pressure-related feature of a heartbeat waveform.

Claim 19 recites, “...wherein a pre-selected heartbeat waveform feature is a difference between two peak pressure amplitudes.” Emphasis added. Claims 20, 34, and 35 recite similar features. A “peak pressure amplitude” of a heartbeat waveform would require a measuring device capable of measuring pressure. As discussed above, the ECG discussed in Biel is incapable of measuring such features.

Claim 21 recites, "...wherein a pre-selected heartbeat waveform feature reflects how far a dicrotic notch is from a zero point." Emphasis added. Claim 36 recites a similar feature. As discussed above, a dicrotic notch is a feature of a pressure-related feature of a heartbeat waveform. As such, the ECG discussed in Biel would be incapable of measuring the recited feature.

Claim 22 recites, "...wherein a pre-selected heartbeat waveform feature is a difference between two peak pressure change rates." Emphasis added. Claims 23, 36, and 37 recite related features. As discussed above, the ECG discussed in Biel would be incapable of measuring the recited features.

V. General Considerations

By the remarks provided herein, Applicants have addressed all outstanding issues presented in the Office Action. Applicants note that the remarks presented herein have been made merely to clarify the claimed invention from elements purported by the Office Action to be taught by the cited references. Such remarks should not be construed as acquiescence, on the part of Applicants, as to the purported teachings or prior art status of the cited references, nor as to the characterization of the cited references advanced in the Office Action. Accordingly, Applicants reserve the right to challenge the purported teachings and prior art status of the cited references at an appropriate time.

CONCLUSION

For the reasons discussed above, Applicants submit that the claims are in proper condition for allowance, and a Notice of Allowance is respectfully requested. If the Examiner notes any further matters that may be resolved by a telephone interview, the Examiner is encouraged to contact John Thompson by telephone at (801) 578-6994.

Respectfully submitted,

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